TM

ECH$_2$O Tec.

Watermakers

PRO SERIES

VERTICAL SYSTEM
115V / 60HZ - 230V / 60HZ

500-PRO-1 / 900-PRO- 2
1200-PRO- 3 / 1500-PRO- 4

OWNERS MANUAL

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INTRODUCTION

Thank you for choosing an ECHO Tec. reverse osmosis desalination system. We trust that you will be completely satisfied with our product.

The purpose of this manual is to allow you to become familiar with each component of your new ECHO Tec. desalination system.

By understanding the function, importance and normal operation of each part in the system, the operator can readily diagnose problems when they first develop. Such problems are easily corrected and require minor adjustments. If left unattended, a small problem in one component will affect the rest of the system and can lead to an expensive repair.

If you have any doubts or questions, please contact us.

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SPECIFICATIONS

Rated Performance:

ECHO Tec:	**500 – PRO – 1**	20 gallons – 75ltr. / hour
	900 – PRO – 2	38 gallons – 140ltr. / hour
	1200 – PRO – 3	50 gallons – 210ltr. / hour
	1500 – PRO – 4	60 gallons – 260ltr. / hour

Reverse Osmosis performance varies with the feed water temperature and salinity. The rated performance is tested at 26°C / 80°F water temperature at a salinity of 35g/l. A decrease in product water quantity of 10 to 15% in the first year is normal and expected.

RO Membrane Type:
Standard size high rejection TFC Polyamide, thin film composite, spiral wound, single pass reverse osmosis element.

Salt Rejection: min. 99.5%

Salinity Range- System 500 / 900: up to 50,000 ppm TDS (NaCl)
1200: up to 40,000 ppm TDS (NaCl)
1500: up to 36,000 ppm TDS (NaCl)

PH Range: 4 – 11

Chlorine Tolerance: 1000 ppm hours

Operating Pressure: 800-850 psi (continuous duty)

Feed Water Pressure: 0 to 60 psi

Feed Water Temperature Range:
min. 33°F / 0.5°C, max 113°F / 45°C

Electrical Power Requirements:
115 V / 60Hz 18.4amps 230V / 60Hz 9.2amps
220/380/440V 60Hz three phase 3.8amps at 380V

Safety Switch Off Functions:
1) High RO pressure: above 1000 PSI
2) Low high-pressure pump feed pressure: below 1.5 PSI
3) High product salinity (optional)

STANDARD SYSTEM FEATURES

1) **Fully assembled desalination system** in aluminum vertical flame with shock mounted Duplex stainless steel high pressure pump, control panels, RO vessels and 5 and 20 micron cartridge filtration system

2) 1 Fresh water flush kit with hose and stainless steel hose clamps

3) 1 Filter wrench

4) **1 Hardener / pH neutralizer kit** with mineral element and 2pcs 3/8" compression fittings
1 Stainless steel bracket with 8 screws

5) 1 Product water tube 10ft / 3m
1 Reject hose 1/2" 10ft / 3m with 2pcs stainless steel hose clamps
1 Intake hose 3/4" 10ft / 3m (braided) with 2pcs stainless steel hose clamps
1 Intake hose 3/4" 3.3ft / 1m (wire coil reinforced) with 2pcs stainless steel hose clamps
1 Service intake hose 5/8" 3ft / 1m with 1pc stainless steel hose clamp

6) 1 Handheld TDS Meter

7) 1 Biocide solution, 1 acid cleaning solution, 1 alkaline cleaning solution

8) 1 Owner's Manual

INSTALLATION INSTRUCTIONS

Position the desalination system in a cool and dry location. Mount the system using all four mounting holes.

The electrical installation should only be done by a professional electrician. Check the correct voltage before installing the system.

The cable labeled with the system's voltage and frequency is to be connected to the power supply. The cable marked "FEED PUMP" is to be connected to the seawater feed pump or should be insulated / removed where pressurized seawater is available.

SEAWATER FEED PUMP (Optional Equipment)

Mount the feed pump in a dry location below the waterline of the vessel. Connect the intake of the feed pump with the vessel's sea strainer (wire coil reinforced hose). Connect the outlet of the feed pump with the intake of the desalination system located at the pre-filter assembly (braided hose). Secure all hoses with the supplied hose clamps. Avoid elbows/90 degree fittings in your plumbing. The complete pump head can be turned in case the outlet direction is not suitable for your installation.

PRODUCT WATER TUBING

Connect the product water outlet marked "SAMPLE" with a test station of your choice. Connect the product water outlet marked "TANK" to your storage tank.

REJECT WATER TUBING/HOSE

Connect the outlet of the pressure control valve on the back of the flow control panel with the 1/2" reinforced PVC hose to a thru hull fitting preferably above the waterline or drain of your choice.

FRESH WATER FLUSH KIT

Install the fresh water flush filter housing at a location near to the desalination system. Connect the flush port of the three-way service valve at the pre-filter assembly of the desalination system with the outlet of the flush filter housing marked "OUT". Supply pressurized fresh water to the shut off valve of the fresh water flush filter housing.

SYSTEM OPERATION INSTRUCTIONS

The reverse osmosis membrane contains a preservative solution to prevent microbiological growth. If ingested, may cause irritation of the gastro-intestinal tract, colic, diarrhea, or other similar symptoms.
Therefore, discard all the product water for at least thirty minutes of initial operation or after storage before drinking or use in food preparations!

Do not operate the system using contaminated feed water sources (oil, chlorine or other chemicals).

Have you filled the high-pressure pump with the proper amount of oil (SAE90 gearbox oil)?

1) Open the seacock and the seawater shut off valve on the pre-filter assembly.
2) Open the pressure control valve on the flow control panel all the way, counter-clock wise.
3) Set the flush/service valve at the pre-filter assembly to the "CLOSED" position (center).
4) Set the diverter valve on the flow control panel to the sample "TEST" position.
5) For the initial start up and after filter changes, set the selector switch on the electrical control panel to the "FEED" position (feed pump only) and purge the system until all entrapped air has escaped.
6) In the "AUTO" position, press the "START" button until the pressure on the low pressure gauge "OUT" has build up. If the high pressure pump motor stops, purge the system again and start the system in the "AUTO" position as before.
7) Close the pressure control valve slowly clockwise and increase the operating pressure until the specified fresh water output for your model is achieved, not exceeding 800PSI.

Caution: Never allow any leaks in your hose or pipe connections. Do not attempt to re-tighten. Always re-seal with Teflon tape or change O-rings as required.

Caution: Do not attempt to re-seal the stainless steel product water outlet fitting on the membrane vessel end cap by further tightening as this could crack the plug.
Remove the fitting, apply new Teflon tape, insert the fitting and hand tighten plus ¼ turn.

8) Check the quality of the product water with the TDS meter. If the water is pure (under 500ppm TDS), switch the diverter valve on the control panel to the "TANK" position.

SYSTEM SHUT DOWN PROCEDURE

1) Switch the diverter valve to the "TEST" position.
2) Open the pressure control valve all the way counter clockwise.
3) Switch the selector switch off.
4) Fresh water flush the system (see next page).
5) Close the seawater shut off valve on the pre-filter assembly and the seacock.

FRESH WATER FLUSH PROCEDURE

Caution: The fresh water pressure should not exceed the range of the low pressure gauge/s. The installation of a pressure reducer may be necessary.

You should fresh water flush your watermaker after every use or infuse a biocide solution for long term storage. The fresh water flush prepares your watermaker for a shut down period of seven days maximum. You can repeat the flush procedure every seven days, to extend the short term storage.

1) Open the pressure control-valve all the way counter-clockwise.
2) Close the shut off valve on the pre-filter assembly and make sure the shut off valve on the flush filter is open.
3) Open the fresh water flush valve on the pre-filter assembly. Your fresh water pressure pump should now turn on. Allow fresh water to flow until all salt water is flushed out of the system (1-2 mins).
   For the next flush procedure, test how long it takes until the brine at the reject outlet of the watermaker becomes fresh (taste or use TDS meter).
4) Open the seawater shut off valve and back flush the pre-filter system with fresh water.
5) Close the fresh water flush valve, the seawater shut off valve and the seacock.

MEMBRANE STORAGE PROCEDURE

If you intend to store your watermaker for more than ten days, growth of microorganism will degrade the RO membranes performance.

The RO membranes should be flushed with a biocide solution to preserve the membrane for long-term storage of up to ten months.

1) Fresh water flush the system.
2) In a clean plastic container, mix 5 gallons / 20 litres of un-chlorinated fresh water with 200 grams (2/3 container) of Echo Tec. Preservative # 3.
3) Switch the three-way valve to the service position. Switch the diverter valve to the sample position. Switch the shut off valve to the off position.
4) Open the pressure control valve all the way anti-clockwise.
5) Infuse the storage solution with the service hose connected to the three-way valve while running the high-pressure pump without applying pressure. Press and hold the “START” button with the selector switch in the “OFF” position to run the high pressure pump only. When the solution has been infused, release the start button and remove the pre-filter cartridges for dry storage.

Under best conditions your watermaker is now prepared for a shut down period of ten months.

Discard the product water for at least thirty minutes of initial operation, after storage, before drinking or before use in food preparations.

MEMBRANE CLEANING PROCEDURE

The membranes of the ECHO Tec. Watermaker must be chemically cleaned when the product water output drops by 20% of the specified amount. The frequency of this occurring will vary greatly depending upon feed water. Fouling of the membranes will naturally occur during normal
usage of the ECHO Tec. Watermaker. Increased amounts of fouling without proper cleaning of the membrane will reduce the performance of your water maker. Cleaning of the membranes will not enhance the quality (TDS reading) of the product water.

CAUTION: The use of chemicals or cleaning methods other than those outlined in the cleaning instructions will void the ECHO Tec. warranty. Nonionic surfactants for membrane cleaning or other chemicals not approved in writing by Echo Marine Ltd. will void the element warranty.

CAUTION: Cleaning chemical #1 is an alkaline detergent. See warning label on side of the container and observe all safety precautions on label.

CAUTION: Cleaning chemical #2 is an acid, a mineral scale remover. See warning label on side of container and observe all safety precautions on label.

CAUTION: Do not mix different cleaning chemicals together. Do not use different cleaning chemicals together at the same time. Mix the cleaning chemicals separately and use them separately.

Note: All cleaning and preserving procedures can be done with either sea water or non-chlorinated freshwater. However, the cleaning process is more effective using non-chlorinated freshwater.

To clean the ECHO Tec. reverse osmosis membranes mix one container (330gram) of cleaning chemical #1 with 5gal / 20ltr of water at 104° F / 40° C.

Re-circulate (disconnect the reject water hose and lead it in the cleaning container) the solution **without pressure** for up to 60 min. (observe the maximum operating temperature of 112° F / 45° C). Do not allow the cleaning container to run dry or air to enter the system.

It is important that the fresh water, remaining from the last flush is dumped before the reject hose is led in the cleaning container to ensure the re-circulation of the undiluted cleaning solution only.

Use cleaning chemical #1 first. If the performance does not improve, use the acid cleaner #2 at the same ratio and instruction.

MAINTENANCE TIMETABLE

The following maintenance timetable is an estimate of the time intervals at which maintenance may be required only. This schedule must be adjusted to the regularity of usage, the condition of the intake water, the length of time the system is exposed to seawater and the total running time following each system cleaning.

COMPONENT	MAINTENANCE REQUIRED	TIME INTERVAL INTERMITTENT DUTY
Seawater intake strainer	Inspect and clean intake.	1000 hrs, or when clogged.
Pre filters	Replace or clean elements and clean housings.	When system intake pressure drops below 5psi.
Charcoal flush filter	Replace element.	Every 6 months.
High pressure pump	Change crankcase oil.	Initial change after 50 hrs. Every 200 operating hours or 6 months.
	Change packings, seals and O-rings.	Every 2000 hrs or when leaking.
R.O. membrane	When production decreases by 20%.	Clean with acid and/or alkaline cleaning compound.
	Replace	When cleaning does not increase production.
Flow meter	Clean inside the clear tube.	Whenever dirty.
	Disconnect product tubing and infuse muriatic acid. Rinse thoroughly!	

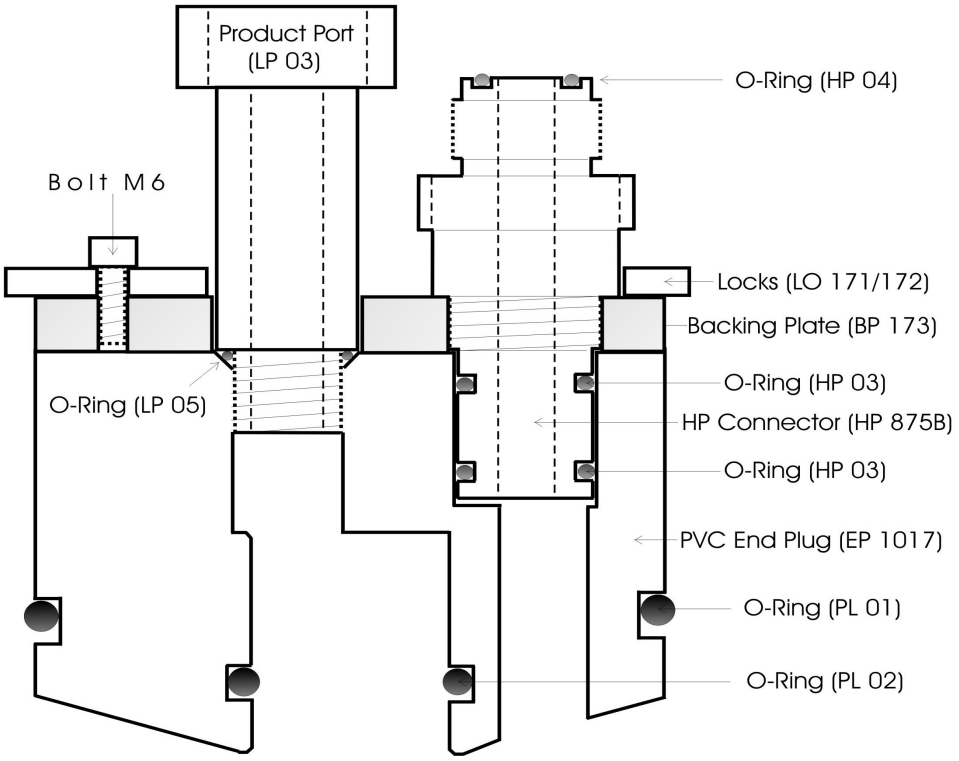
MEMBRANE CHANGING PROCEDURE
PRESSURE VESSEL END PLUG CHANGING PROCEDURE

1) Remove the product port (if installed) and the high pressure fitting.
2) Remove the two/three M6 bolts.
3) Remove the two/three locking plates (locks)
4) Remove the backing plate
5) Pull the end plug with the aid of a hand tight inserted product port in one fast pull.

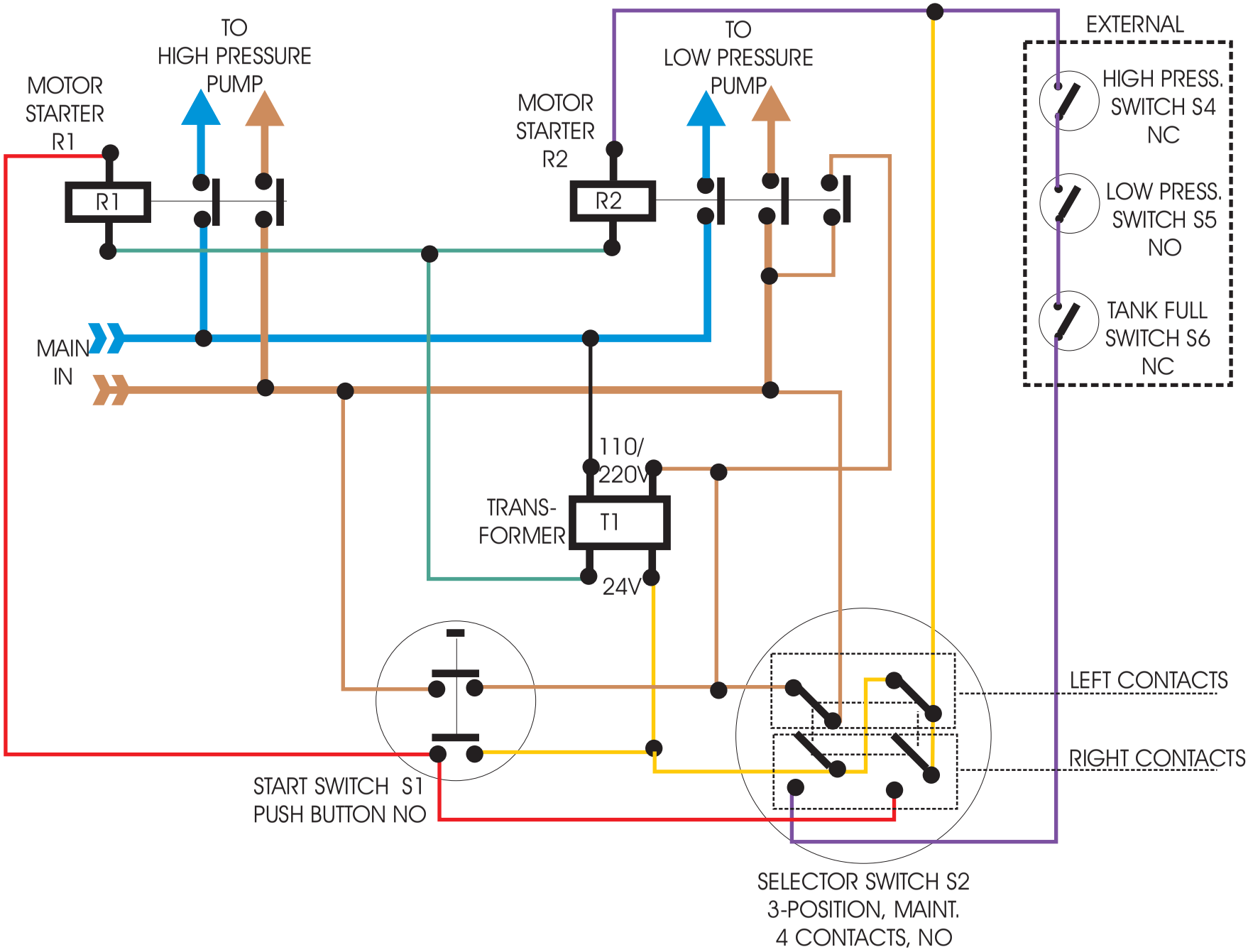
Should the plugs O-ring (PL01) get stuck in the groove of the pressure vessel, it will be more difficult to pull the plug. If the plug gets stuck, tap it in, apply silicone lubricant to the vessel's inner wall and remove it in one fast pull.

6) Inspect the end plug for hairline cracks or damages on the O-rings and O-ring grooves.
7) Pull the membrane on the product pipe out of the pressure vessel or remove both plugs and push the membrane out (in flow direction!)
8) Insert the new membrane observing the correct direction of the lipped seal ring on the high pressure entry side of the membrane (lip against flow direction).
9) Clean the product port and end plug threads from remaining Teflon sealant.
10) Apply Teflon sealant to the threads of the product port.
11) Insert the end plug and reassemble all components visa versa starting with (5).

It is important not to over tighten the product port/s to avoid the end plug to crack.



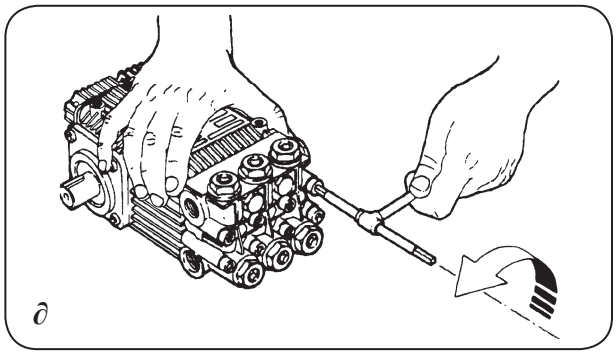
ELECTRICAL DIAGRAM, CONTROL BOX, ECHOTEC. PRO - BHL SERIES, VERSION 2008/03

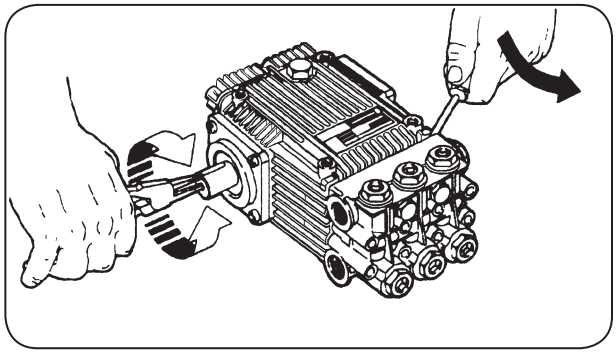


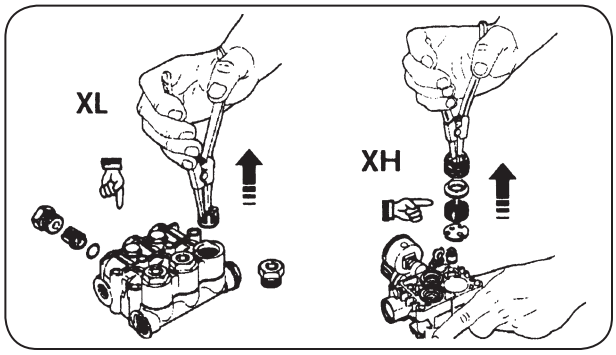
HIGH PRESSURE PUMP SYSTEM TROUBLESHOOTING GUIDE

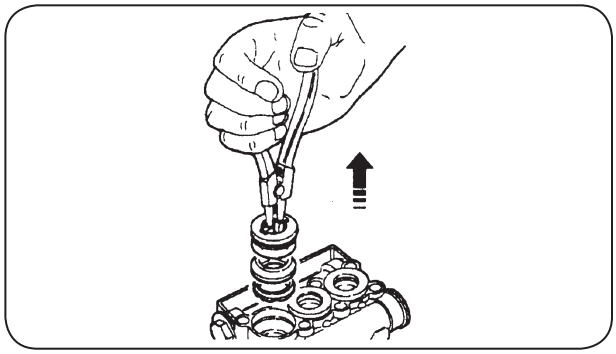
MALFUNCTION	CAUSE	REMEDY
The pressure drops	Worn packing seals	Replace seals
	broken valve spring	Replace spring
	Fouled inlet strainer	Clean strainer
	Fouled pre-filter(s)	Replace filter cartridge(s)
	Cavitation	Check suction lines for restrictions
Water in crankcase	High humidity	Reduce oil change interval
	Worn seals	Replace seals
Noisy operating	Worn bearings	Replace bearings, refill crankcase with recommended lubricant
	Cavitation	Check inlet lines for restrictions Check strainer and filter(s)
Inability to build up pressure	Discharge valve chamber has air trapped within it	Allow more time to prime and ensure that there are no air suction leaks. Open valve chambers and allow air to escape
Rough/Pulsating operation with	Worn seals	Replace seals Check system for stoppage or air suction leaks
pressure drop	Cavitation	Check inlet lines for restrictions
Excessive leakage between the high pressure pump manifold and rear crankcase section	Worn plunger(s)	Replace plunger(s)
	Worn seals	Replace seals
	Cracked plunger(s)	Replace plunger(s)
High crankcase temperature	Wrong grade of oil	Use specified type of oil.
	Improper amount of oil in crankcase	Adjust oil level to proper amount

HIGH PRESSURE PUMP REPAIR INSTRUCTION
ECHO TEC PUMP SERIES
XL-60/2.3, XL-60/3.0 AND XL-60/3.6



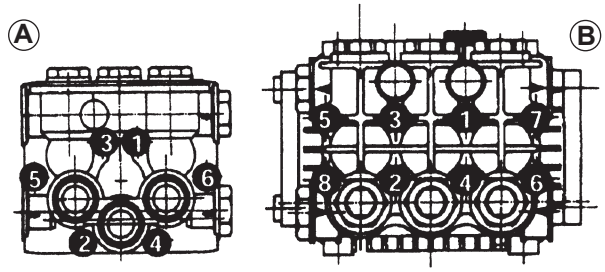






∂ Assembly - Disassembly Of The Pump Head

1.1 - Unscrew head bolts.



Tightening sequence of head bolts, Ⓐ for XT Series and HPE Series, Ⓑ for XR Series and XL Series.

1.2 - Remove the head by rotating the shaft and levering between head and body.

1.3 - For re-assembly: Invert above instructions, and keep to torque rates shown on page 8.

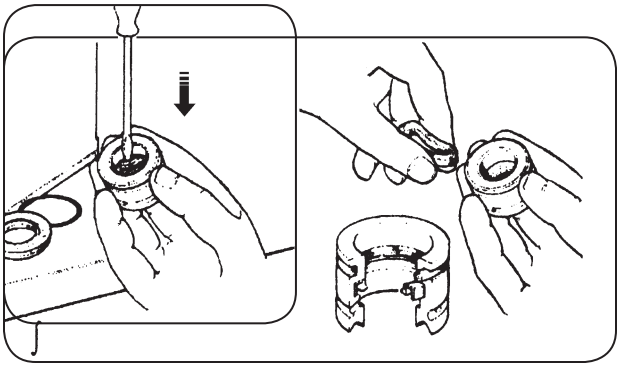
Inspection inlet/outlet valves

2.1 - Remove valve caps, slide out inlet/outlet valves check the sondition of the various components of the valve and well as the O-Ring, replace if necessary.

2.2 - For re-assembly: Invert previous operation.

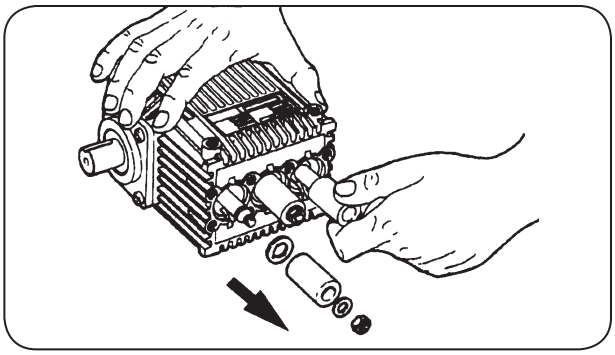
Replacing packing and recovery seals

3.1 - Remove the head (See ∂), then slide out piston guides, being careful not the deform them, using the special extractor pliers.



3.2 - Disassemble the components of the piston guide, checking the condition, replace if necessary.

3.3 - For re-assembly: Invert operation.

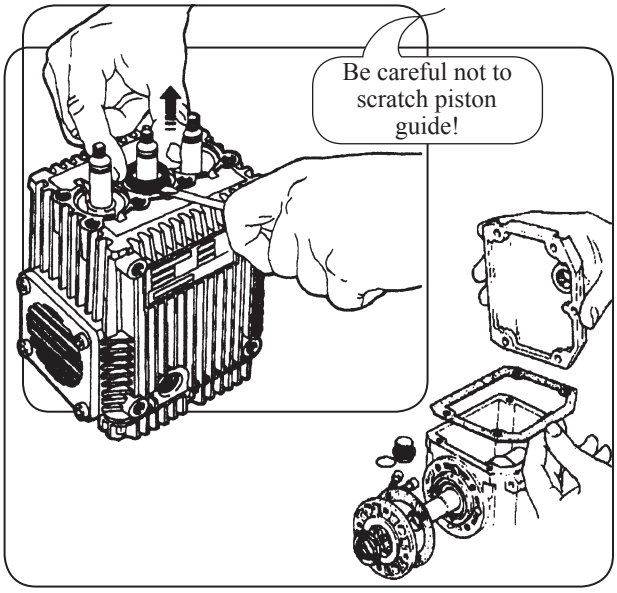


Replacing the pistons

4.1 - Remove the head (See *∂*), then unscrew the piston retainers.

4.2 - Slide off the ceramic pstions, check their condition, and replace if necessary.

4.3 - For re-asembly: Invert above operations. Keep to torque rating and shown on page 8.



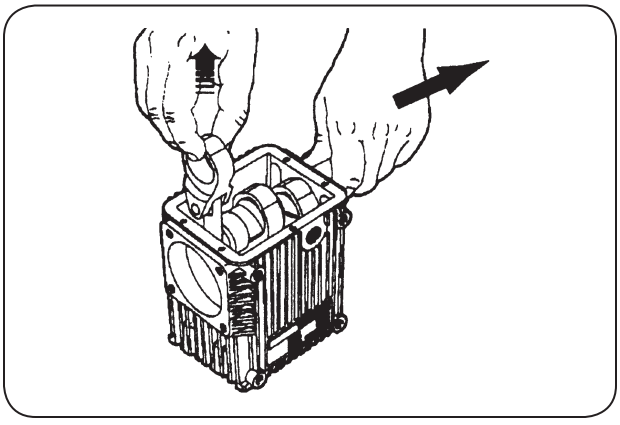
Replacing oil seals

6.1 - Remove the head (See *∂*),
- remove the ceramic pistons
- discharge oil

6.2 - Remove the oil seals and the O-Rings, checking the seats and the piston guides.

6.3 - Remove the rear cover gasket.

6.4 - For re-assembly: Invert above operations. Keep to torque ratings as shown on page 8.



Crank mechaism maintenance

7.1 - Remove the head (See *∂*),
- remove the ceramic pistons
- discharge oil

7.2 - Remove the rear cover.

7.3 - Remove the con-rod sliding the one piece-rod whilst removing the shaft.

7.4 - For re-assembly: Invert above operations. Replace the oil seals!

ECH$_2$O TEC. WATERMAKER LIMITED WARRANTY

Echo Marine Ltd. warrants to the original purchaser for a period of twenty-four (24) months from the date of shipment that the ECHO Tec. watermaker will perform according to specifications. The triplex plunger high-pressure pump and the high-pressure vessel/s are guaranteed for five years to the original purchaser. Echo Marine's liability under this warranty shall be limited to repair or replacement of the ECHO Tec. watermaker at Echo Marine's option. Under no circumstances shall Echo Marine Ltd. be liable for consequential damages arising out of or in any way connected with the failure of the system to perform as set forth herein. This limited warranty is in lieu of all other expressed or implied warranties, including those of merchantability and fitness for a particular purpose.

In the event of a defect, malfunction, or failure during the warranty period, Echo Marine Ltd. will repair or replace, at its option, the product or component therein which, upon examination by Echo Marine, shall appear to be defective, or not up to factory specifications.

To obtain warranty service, the defective product or part must be returned to Echo Marine's Service Center. The purchaser must pay any transportation or labor expenses incurred in removing and returning the product. A return authorization must be obtained before any part or component is shipped.

The limited warranty does not extend to any system component which has been subjected to misuse, neglect, accident, improper customer installation, or used in violation of instructions furnished by Echo Marine Ltd. The warranty does not extend to components on which the serial number has been removed, defaced or changed.

Echo Marine Ltd. reserves the right to make changes or improvements in its product during subsequent production without incurring the obligation to install such changes or improvements on previously manufactured equipment.

The implied warranties, which the law imposes on the sale of this product, are expressly LIMITED, in duration to the time period above. Echo Marine shall not be liable for damages, consequential or otherwise, resulting from the use and operation of this product or from the breach of this LIMITED WARRANTY.

This limited warranty service does not apply to normal recurring user maintenance as described below.

- Sea Strainer Element
- Pre-filter Cartridges
- Auxiliary Tubing
- Pump Seals and Packings
- Pump Bushings and Bearings
- Pump Valve Assemblies
- Gauge Instrument Calibration
- Pump Crankcase Oil
- V or Timing Belt

The ECHO Tec. Membrane Element is guaranteed to be cleanable for a minimum of one year from date of shipment, or commissioning of the system by Echo Marine Ltd, provided that cleaning instructions are adhered to and foulant is acid soluble metal hydroxides and calcium carbonates or alkaline soluble organic, inorganic substances and microbiological slimes. The ECHO Tec. Membrane Element is not guaranteed against iron fouling (rust), chemical attack, extreme temperatures (over 113º F/under 33ºF), drying out, or extreme pressures (over 1000 psig).

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